

REMARKS

Claims 1, 2, 10, and 11 are amended herein; claims 1, 2, and 4-11 are pending.

Claim Rejections - 35 USC §112 paragraph 2

Claims 2 and 11 were rejected under 35 USC §112 paragraph 2 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants respectfully traverse the rejection and, to the extent it is maintained with respect to the claims as amended herein, requests reconsideration and withdrawal of the rejection.

Claims 2 and 11 are amended herein to clarify the subject matter believed by Applicants to be their invention. No equivalents to which Applicants are entitled are surrendered. Claims 2 and 11 are amended herein to recite that the amine is selected from the Markush group consisting of options c), d), e) and f), or any combination of the options of c), d), e) and f); and the language "wherein R¹ is a divalent alkylene radical comprising 2 - 3 carbon atoms, R² is a divalent alkylene radical comprising 2 - 4 carbon atoms and R³ is an alkyl radical comprising 1 - 4 carbon atoms" describes only the structure recited in option f).

Claims 2 and 11 are also amended to specify the range of claimed values of x, the number of repeating units in the alkylpolyethyleneglycol amine of option f), although the Examiner did not reject the claim on this basis. Support for the range values is found in Examples 8 and 9, wherein compounds of this type are specified to be of the Pluriol® tradename and of the A type, which are produced by BASF, and which span a molecular weight of about 350 to 5000, as is shown in the accompanying copy of the BASF product specifications.

Claim Rejections - 35 USC §102(b)

Claims 1-2 and 4-9 were rejected under §102(b) as anticipated by EP 0 311 157, as evidenced by patent family members U.S. Pat. Nos. 5,688,858 and 4,302,561, of Elka-Chemicals BV.

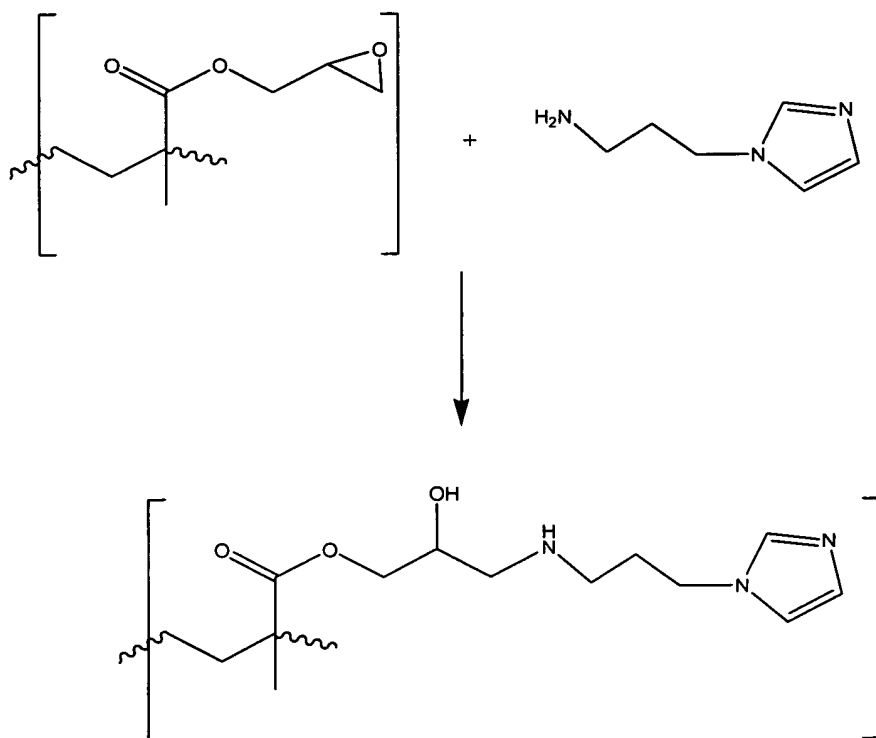
Applicants traverse the rejection and, to the extent it is maintained with respect to the claims as amended herein, request reconsideration and withdrawal of the rejection.

The Examiner specifically cites Example 4 of the '858 patent (which is identical to Example 4 of EP 0 311 157) as anticipating claim 1. Applicants respectfully submit that the Examiner has misapplied this reference. Claim 1 of the present application refers specifically to an "aminolysis product of an acrylic acid alkyl ester polymer" with an amine, and this reaction is further clarified in the Specification as involving the reaction of an amine with an ester to produce an amide, with elimination of the alcohol that the ester had comprised. The Specification of the current application refers to "aminolysis of the ester bond" (page 2 line 30), "at least part of the ester groups of the polymer is reacted to form acid amides" (page 3 line 8), and "aminolysis of the polyacrylic esters" (page 5 line 16).

In contrast, example 4 of the cited document is clearly a reaction of an amine with an epoxide, not with an ester group. Example 4 (paragraph 2) specifies the reaction of 1-(3-aminopropyl)imidazole with a polymer formed from vinyl toluene, isobutyl methacrylate, 2-ethylhexyl methacrylate, stearyl methacrylate and glycidyl methacrylate. Of these reactants, vinyl toluene (analogous to styrene) does not leave any potentially reactive group after polymerization other than a methyl or phenyl group. After polymerization of the methacrylates and vinyl toluene, the methacrylate esters all leave ester groups after polymerization, but the glycidyl ester leaves a glycidyl epoxide group (2,3-epoxyprop-1-yl) as a potentially reactive group. Based on the known relative reactivities of epoxide groups and of alkyl ester groups with amines, it is apparent that in Example 4 the amine is reacting with the epoxide group, not with any ester groups. It is well known in the art that epoxides are highly reactive groups relative to simple esters towards nucleophiles such as amines; therefore a glycidyl epoxide group is expected to be more reactive than a simple ester such as an isobutyl, 2-ethylhexyl, or stearyl ester. See, for example, Jerry March, *Advanced Organic Chemistry*, John Wiley, New York, 4th ed., 1992. On page 423, March notes that in the reaction of carboxylic esters with amines, "simple esters (R = Me, Et, etc.) are not very reactive," whereas on page 416 March notes that epoxides react readily with ammonia, as well as with primary and secondary amines, with additional information given on page 411 to the effect that primary and secondary amines are stronger bases than ammonia and are therefore even more reactive than ammonia in nucleophilic substitution reactions. Thus, the amino group of the 1-(3-aminopropyl)imidazole of Example 4 of the '157 patent, as a primary amine, would be expected to readily react with the epoxy group of the glycidyl ester, but not readily at all with the alkyl ester groups of the methacrylate

polymer. It should be noted that the reaction of the nucleophilic amine with the epoxide is particularly facile in this case as the glycidyl ester comprises a primary, unhindered epoxide. The molar ratio given in Example 4 between the epoxide groups in the polymer and the amine reactant is 1:1 (32 mmoles each). As the molar ratio of the epoxide and the amine are equal, the amine is completely consumed by its preferential reaction with the epoxide group, and none is left to react with the less-reactive ester groups.

This reaction is as shown below:



Therefore, the reaction that is taking place in Example 4 of the cited document is not aminolysis of an ester, but is the nucleophilic addition of an amine to an epoxide. This is further supported in the disclosure of the '858 patent where (column 3, lines 46-63) the list of reactive groups that is given does not include an ester group, but is specified to include reaction of a "diisocyanate, diepoxyd[sic], diol, dicarboxylic acid, hydroxycarboxylic acid, aminocarboxylic acid, amino-ol [amino-alcohol]" with a compound with at least one reactive group that is stated to include an -NH_2 group. Clearly, the authors of the '858 patent (and of EP 0 311 157) did not contemplate aminolysis of an ester group for incorporation of a heterocyclic amine into an existing polymer chain, as is claimed in the present application.

As the Examiner points out, claims 1 and 2 of the present application are product-by-process claims, and it is the patentability of the product of that process that must be established. The Efka-Chemicals patent family does not disclose amides of carboxylic acids borne by the polymer backbone, as are claimed in the present application. The Efka-Chemicals patents disclose only amino-alcohols such as are formed by reactions of amines with epoxides, and ureas such as are formed by reaction of amines with isocyanates, the epoxides and the isocyanates being borne by the polymer backbone. Therefore, the Efka-chemicals patents EP 0 311 157 and its U.S. counterparts '858 and '561 cannot anticipate claim 1 or claims dependent thereon of the present application.

Applicants therefore respectfully request that this rejection be withdrawn.

Claim Rejections - 35 USC § 103(a)

Claims 10-11 were rejected under §103(a) as obvious over Elka-Chemicals BV, EP 0 311 157, as evidenced by patent family members U.S. Pat. Nos. 5,688,858 and 4,302,561.

Applicants traverse the rejection and, to the extent it is maintained with respect to the claims as amended herein, request reconsideration and withdrawal of the rejection.

As discussed above, the Efka-Chemicals patent family cannot make the claims of the present application obvious, as they do not disclose a process for producing a product by aminolysis of an ester by an amine. For a combination of references to render a claim obvious, all the claim elements of the rejected claims must be found within the combination. *In re Wilson*, 424 F.2d 1382, 1385 (C.C.P.A. 1970). None of these patents describes formation of amide sidechain products by reaction of polymeric esters with amines; as noted above the amines react with epoxides, not esters. In contrast, claims 10 and 11 recite a process comprising aminolyzing an acrylic acid ester polymer with at least one amine. Therefore, a *prima facie* case of obviousness has not been properly established.

Applicants therefore respectfully request that this rejection be withdrawn.

Claim Rejections - 35 USC § 103(a)

Claims 1-2 and 4-9 were rejected under §103(a) as obvious over Emmons, U.S. Pat. No. 4,120,839.

Applicants traverse the rejection and, to the extent it is maintained with respect to the claims as amended herein, request reconsideration and withdrawal of the rejection.

Emmons discusses the use of "a polyamine of an aliphatic nature" in an aminolysis reaction with an oligomeric homopolymer of an alkyl methacrylate or a copolymer of at least two alkyl methacrylates. Emmons does not disclose a class of compounds of the formula $\text{NH}_2\text{-R}^1\text{-Z}$ wherein R^1 is a divalent alkylene radical comprising 2-4 carbon atoms and Z is a 5- or 6-membered N-containing heterocycle of up to 2 nitrogen atoms and optionally an oxygen atom. Emmons provides only a single example of an aliphatic triamine, N-aminoethylpiperazine, wherein the heterocycle is a saturated heterocycle, piperazine, that could fit this definition of $\text{NH}_2\text{-R}^1\text{-Z}$.

Claims 1 and 10 are amended herein to limit the amine to compounds of the formula $\text{NH}_2\text{-R}^1\text{-Z}$ wherein R^1 is a divalent alkylene radical comprising 2-4 carbon atoms and Z is a 5- or 6-membered N-containing heteroaryl of up to 2 nitrogen atoms and optionally an oxygen atom. This amendment is fully supported by the specification; "heteroaryl" is a subset of "heterocycle" and falls entirely within the larger class but is limited to aromatic heterocycles, and heteroaryls are disclosed to be preferred embodiments of the present invention; see, for example, page 4, lines 23-24 wherein N-(3-aminopropyl)imidazole is disclosed. See also Example 3. The single compound, N-aminoethylpiperazine, disclosed in Emmons is not a heteroaryl. Therefore, as amended, claims 1 and 10, and the claims dependent thereon, can no longer be obvious in view of Emmons.

Applicants respectfully request that the rejection be withdrawn.

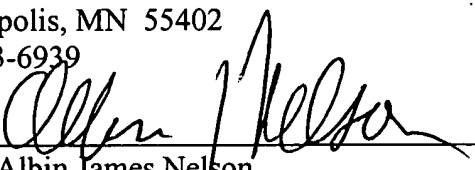
Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney 612-373-6939 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

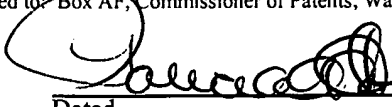
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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Box AF, Commissioner of Patents, Washington, D.C. 20231, on this 16th day of October, 2006.

PATRICIA A. HULTMAN
Signature


Dated